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10/677,241	10/03/2003	Hideyuki Sakaida	Q77625	9108

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SUGHRUE MION, PLLC
2100 PENNSYLVANIA AVENUE, N.W.
SUITE 800
WASHINGTON, DC 20037

EXAMINER
SMITH, JEFFREY S

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/677,241	SAKAIDA, HIDEYUKI	
	Examiner	Art Unit	
	JEFFREY S. SMITH	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 March 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Double Patenting

Claims 1-6 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-10 of U.S. Patent No. 7171031 ("'031") in view of Physical Principles of Medical Imaging, 2nd Edition, by Perry Sprawls, Jr., chapter 18 pages 253-265, 1993 ("Sprawls").

Claim 1 of the '031 patent recites

> (a) **obtaining at least three first differential signals** representing differentials between one image signal and another image signal on the basis of at least four image signals **obtained by detecting intensity** of radiation on at least four planes that are parallel and positioned at different distances from the object, said at least four image signals respectively representing radiation image information on said at least four planes; ... (c) **obtaining a Laplacian of phase** on the basis of the at least three image signals and at least three sets of the first to third differential signals; and (d) **performing inverse Laplacian operation** on the Laplacian of phase so as to restore phase information.

which reads on claim 1 of the application

> (a) **obtained by detecting intensity** of radiation on plural detection planes at different distances from the object, said plural sets of detection data representing radiation image information on the plural detection planes, respectively; (b) **obtaining differential data** representing difference between first detection data and second detection data of said plural sets of detection data; (c) **obtaining Laplacian of phase** on the basis of said differential data and any one of said plural sets of detection data and the detection data; and (d) obtaining phase data of the radiation by **performing inverse Laplacian computation** on the Laplacian of phase.

Claim 1 of the '031 patent does not recite correcting blur amount. Sprawls discloses correcting blur amount by filter processing using a function of spatial frequencies (compare figure 5 of the application which shows a function of spatial

frequencies for correcting blur with figures 18-7, 18-8 and 18-9 of Sprawls which show the same function).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify claim 1 of the '031 patent to correct blur using a function of spatial frequencies for the benefit of removing blur as taught by Sprawls. Therefore, the result of applying a known blur correction method such as one of those disclosed by Sprawls to a blurred image such as that produced by claim 1 of the '031 patent would be a predictable blur corrected image. Because the limitations in claim 1 are "exemplary of the corresponding limitations in claims 3 and 5 as well" as stated on page 7 of applicant's last response, claims 3 and 5 are rejected for these reasons as well. For claims 2, 4 and 6, figures 18-7, 18-8 and 18-9 show multiple blur functions that are used to remove blur amounts caused by a focal size ("focal spot blur" page 262). Removing the blur amounts uniformly was within the ordinary capabilities of one skilled in the art using the several functions of Sprawl.

Claims 1-6 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-3 of U.S. Patent No. 6704591 ("'591") in view of Physical Principles of Medical Imaging, 2nd Edition, by Perry Sprawls, Jr., chapter 18 pages 253-265, 1993 ("Sprawls").

Claim 1 of the '591 patent recites

> A method of restoring phase information of radiation transmitted through an object on the basis of a plurality of image signals respectively **obtained by detecting intensity** of radiation transmitted through the object on a plurality of planes different in distance from the object, each of the plurality of image signals

> representing radiation image information on the plurality of planes, said method comprising the steps of: **obtaining a differential signal** representing difference between a first image signal and a second image signal of said plurality of image signals; … **obtaining Laplacian of phase** with respect to said differential signal and said third image signal; and restoring phase information of the radiation by **applying an inverse Laplacian operation** to said Laplacian of phase.
>
> which reads on claim 1 of the application
>
> (a) **obtained by detecting intensity** of radiation on plural detection planes at different distances from the object, said plural sets of detection data representing radiation image information on the plural detection planes, respectively; (b) **obtaining differential data** representing difference between first detection data and second detection data of said plural sets of detection data; (c) **obtaining Laplacian of phase** on the basis of said differential data and any one of said plural sets of detection data and the detection data; and (d) obtaining phase data of the radiation by **performing inverse Laplacian computation** on the Laplacian of phase.

Claim 1 of the '591 patent does not recite correcting blur amount. Sprawls discloses correcting blur amount by filter processing using a function of spatial frequencies (compare figure 5 of the application which shows a function of spatial frequencies for correcting blur with figures 18-7, 18-8 and 18-9 of Sprawls which show the same function).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify claim 1 of the '591 patent to correct blur using a function of spatial frequencies for the benefit of removing blur as taught by Sprawls. Therefore, the result of applying a known blur correction method such as one of those disclosed by Sprawls to a blurred image such as that produced by claim 1 of the '591 patent would be a predictable blur corrected image. Because the limitations in claim 1 are "exemplary of the corresponding limitations in claims 3 and 5 as well" as stated on page 7 of applicant's last response, claims 3 and 5 are rejected for these reasons as well. For

claims 2, 4 and 6, figures 18-7, 18-8 and 18-9 show multiple blur functions that are used to remove blur amounts caused by a focal size ("focal spot blur" page 262). Removing the blur amounts uniformly was within the ordinary capabilities of one skilled in the art using the several functions of Sprawl.

Claims 1-6 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 3-4 and 11-12 of copending Application No. 10/671,786 ("'786") in view of Physical Principles of Medical Imaging, 2nd Edition, by Perry Sprawls, Jr., chapter 18 pages 253-265, 1993 ("Sprawls").

Claim 3 of the '786 application recites

> (a) **obtaining plural sets of detection data** respectively representing plural kinds of radiation image information on plural detection planes at different distances from the object by using a radiation having a predetermined wavelength with energy from 16 keV to 30 keV to **detect intensity** of the radiation on said plural detection planes; and (b) restoring phase information on the radiation transmitted through the object on the basis of **obtaining a differential coefficient** between said plural sets of detection data; so-as-to obtain phase data (c) **calculating a Laplacian of phase** on the basis of said differential coefficient and any one of said plural sets of detection data; and (d) **performing inverse Laplacian computation** on the Laplacian of phase to obtain the phase information.

which reads on claim 1 of the application

> (a) **obtained by detecting intensity** of radiation on plural detection planes at different distances from the object, **said plural sets of detection data** representing radiation image information on the plural detection planes, respectively; (b) **obtaining differential data** representing difference between first detection data and second detection data of said plural sets of detection data; (c) **obtaining Laplacian of phase** on the basis of said differential data and any one of said plural sets of detection data and the detection data; and (d) obtaining phase data of the radiation by **performing inverse Laplacian computation** on the Laplacian of phase.

Claim 3 of the '786 application does not recite correcting blur amount. Sprawls discloses correcting blur amount by filter processing using a function of spatial frequencies (compare figure 5 of the application which shows a function of spatial frequencies for correcting blur with figures 18-7, 18-8 and 18-9 of Sprawls which show the same function).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify claim 3 of the '786 application to correct blur using a function of spatial frequencies for the benefit of removing blur as taught by Sprawls. Therefore, the result of applying a known blur correction method such as one of those disclosed by Sprawls to a blurred image such as that produced by claim 3 of the '786 patent would be a predictable blur corrected image. Because the limitations in claim 1 are "exemplary of the corresponding limitations in claims 3 and 5 as well" as stated on page 7 of applicant's last response, claims 3 and 5 are rejected for these reasons as well. For claims 2, 4 and 6, figures 18-7, 18-8 and 18-9 show multiple blur functions that are used to remove blur amounts caused by a focal size ("focal spot blur" page 262). Removing the blur amounts uniformly was within the ordinary capabilities of one skilled in the art using the several functions of Sprawl.

This is a provisional obviousness-type double patenting rejection.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gureyev (cited in the previous action) in view of applicant's admitted prior art discussed in the application as originally filed and in view of Sprawls (cited above).

For claims 1, 3 and 5, Gureyev discloses "plural sets of detection data obtained by detecting intensity of radiation on plural detection planes at different distances from the object, said plural sets of detection data representing image information on the plural detection planes." (See abstract, "the appropriate processing of phase-contrast images obtained in the in-line geometry." See also Figures 1 and 2 and page 361 "We then computed the free-space propagation (calculating the full Kirchhoff integrals) of that complex amplitude from the plane z=0 to z=0.15m.") Using the disclosure of Gureyev to obtain plural sets of detection data using the device shown in figure 1 of Gureyev, which is also shown in figure 9 of applicant's admitted prior art, is admitted as prior art on page 6 of the application which states that "In the expression (4), by using intensity I(x, y) of a plurality of X-rays which entered the screen 102 at a different distance of z from the object plane 101, Φ(x, y) can be obtained by a solving method such as the finite-element method." Applicant also admits that this feature is prior art at page 17 which states that "even if phase information is obtained by using plural sets of detection data having non-uniform blur amounts as in a conventional method".

A person of ordinary skill in the art at the time of invention after reading applicant's admitted prior art would be able to use the device of Gureyev to produce

plural sets of detection data obtained by detecting intensity of radiation on plural detection planes at different distances from the object, because the plural sets of detection data obtained in the admitted prior art are obtained by using the in line imaging device of figure 9, which is similar, if not identical to the in line imaging device shown in figure 1 of Gureyev. Therefore, the result of applying a known blur correction method such as one of those disclosed by Sprawls to a blurred image such as that produced by the conventional method of Gureyev and the admitted prior art as discussed on page 17 of the specification would be a predictable blur corrected image.

The combination of Gureyev and admitted prior art discloses "obtaining differential data representing difference between first detection data and second detection data of said plural sets of detection data." (See page 357, "processing of the differential images.")

The combination of Gureyev and admitted prior art discloses "obtaining Laplacian of phase on the basis of said differential data and any one of said plural sets of detection data." (See equation 3a which obtains the Laplacian of phase data, page 6 of the specification which obtains the Laplacian of phase on the basis of the difference data, and page 17 of the specification which discusses using plural sets of detection data to obtain phase information).

The combination of Gureyev and admitted prior art discloses "obtaining phase data of the radiation by performing inverse Laplacian computation on the Laplacian of phase." (See page 360 "There are many well-known methods for solving equations of the type (2) and (3)." Equation 3a expresses the Laplacian of phase, a person of

ordinary skill in the art at the time of invention is able to obtain phase data by taking the inverse Laplacian on the Laplacian of phase as discussed on page 360 and page 6 admitted prior art in the specification, which takes the inverse Laplacian of equation 4 using the finite-element method).

Sprawls discloses "correcting blur amount by filter processing using a function of spatial frequencies." (compare figure 5 of the application which shows a function of spatial frequencies for correcting blur with figures 18-7, 18-8 and 18-9 of Sprawls which show the same function).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Gureyev and admitted prior art to correct blur using a function of spatial frequencies for the benefit of removing blur as taught by Sprawls. In this particular case, the technique of correcting blur amount by filter processing using a function of spatial frequencies was part of the ordinary capabilities of one skilled in the art. Applying the known technique of Sprawl's blur correction to Gureyev's differential data would have yielded predictable results of blur corrected phase data to one of ordinary skill in the art at the time of the invention. Furthermore, obtaining Laplacian of phase on the basis of differential data, detection data before correcting blur, and detection data after correcting blur would be obvious to try, because the only options available to one of ordinary skill, after reading Sprawl's blur correction, are using blur corrected differential data, blur uncorrected differential data, blur corrected detection data and blur uncorrected detection data in Gureyev's method of phase contrast

imaging. The claim would have been obvious because a person of ordinary skill has good reason to pursue these known options that are within his or her technical grasp.

For claims 2, 4 and 6, figures 18-7, 18-8 and 18-9 show multiple blur functions that are used to remove blur amounts caused by a focal size ("focal spot blur" page 262). Removing the blur amounts uniformly was within the ordinary capabilities of one skilled in the art using the several functions of Sprawl.

Response to Arguments

Applicant's arguments with respect to claims 1-6 have been considered but are moot in view of the new ground(s) of rejection. Nevertheless, applicant's arguments will be addressed in order to advance prosecution.

Applicant argues that Gureyev does not disclose blur correction, and Sprawls does not disclose differences in image data. Such an argument is irrelevant in a rejection based on 35 USC 103. A person of ordinary skill in the art at the time of invention, after seeing the blur in the differential data of Gureyev and the admitted prior art, can apply known blur correction methods such as those disclosed by Sprawls, to achieve the predictable result of a blur corrected differential data. Applicant has submitted absolutely nothing to shown an unpredictable result.

With respect to the alleged deficiencies in Gureyev relating to differential data, Laplacian of phase, and inverse Laplacian of phase, everything about Gureyev is focused on these features, as discussed at length by applicant himself in his own specification. Applicant in his remarks states that page 17 accurately states that "even if phase information is obtained by using plural sets of detection data having non-

uniform blur amounts as in a conventional method," yet continues to argue this and other conventional features are a basis for patentability simply because Gureyev does not explicitly disclose these features using the exact wording of the claim. Applicant is requested to stop asserting that conventional elements recited in the claim form a basis for patentability simply because one reference does not explicitly disclose them using the exact language of the claim. Applicant is further requested to provide references that disclose the admittedly conventional features as stated in the requirement for information and response to arguments of previous actions.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jeffrey S. Smith whose telephone number is 571 270-1235. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jingge Wu can be reached on 571 272-7429. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Andrew W. Johns/
Primary Examiner, Art Unit 2624

JSS
November 6, 2007